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Research Note

UNITED STATES DEPARTMENT OF AGRICULTURE
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1966

CONTROLLING SOIL MOVEMENT FROM STEEP ROAD FILLS

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ABSTRACT

Eight test plots were established on the fill slope of a newly constructed road. One plot was retained as a control, while different soil-stabilizing treatments were used on each of the other plots. These consisted of various combinations of seeding, fertilizing, mulching, and surface netting. Treatments that included both straw mulch and netting effectively controlled erosion.

Bogus Basin road is a two-lane highway on the Boise National Forest leading from Boise, Idaho, to the Bogus Basin ski resort. The highway traverses steep terrain, the soils of which are typical of those derived from the loose, weathered, granitic material of the Idaho batholith. This material erodes readily and poses a problem to those concerned with stabilizing road fills.

In the fall of 1962, eight contiguous test plots--each 43.6 feet in length--were established on a raw fill slope by inserting planks at 10-foot intervals into the ground (fig. 1). The slope had an average gradient of 80 percent on a southeast exposure at an elevation of 5,650 feet. A sediment catchment trough was placed at the bottom of each plot (fig. 2).

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[1] Bethlahmy, who was project leader of the Station's watershed management project at Boise, Idaho, accepted an FAO assignment in Taiwan in July 1966, while Kidd is still assigned to the project. Both are research foresters. Field installations were made under the direction of District Ranger Jack M. Wilcock, Boise National Forest.

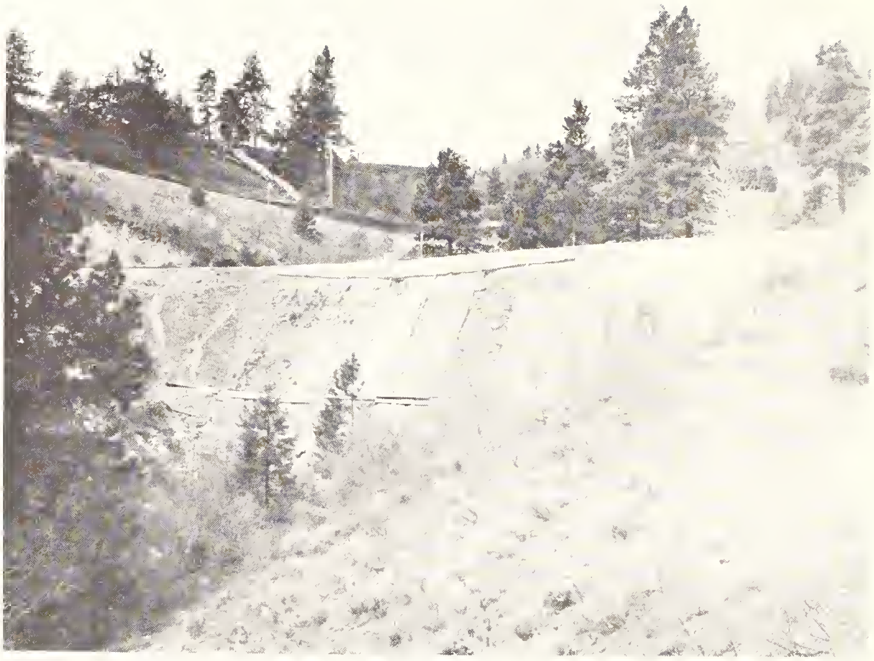

Figure 1.--Overall view of the test plots that were established on a steep fill slope on the Bogus Basin road.

PROCEDURE

The plots were numbered consecutively. Plot 1 was left untreated to serve as a control, while the remaining plots were treated as follows:

Plot number	Sequence of treatment
1	Control--no treatment at all.
2	Contour furrows, seed, fertilizer, holes.
3	Contour furrows, straw mulch, seed, fertilizer, holes.
4	Polymer emulsion, seed, fertilizer.
5	Straw mulch, paper netting, seed, fertilizer.
6	Straw mulch, jute netting, seed, fertilizer.
7	Seed, fertilizer, straw mulch, chicken wire netting.
8	Seed, fertilizer, straw mulch with asphalt emulsion.

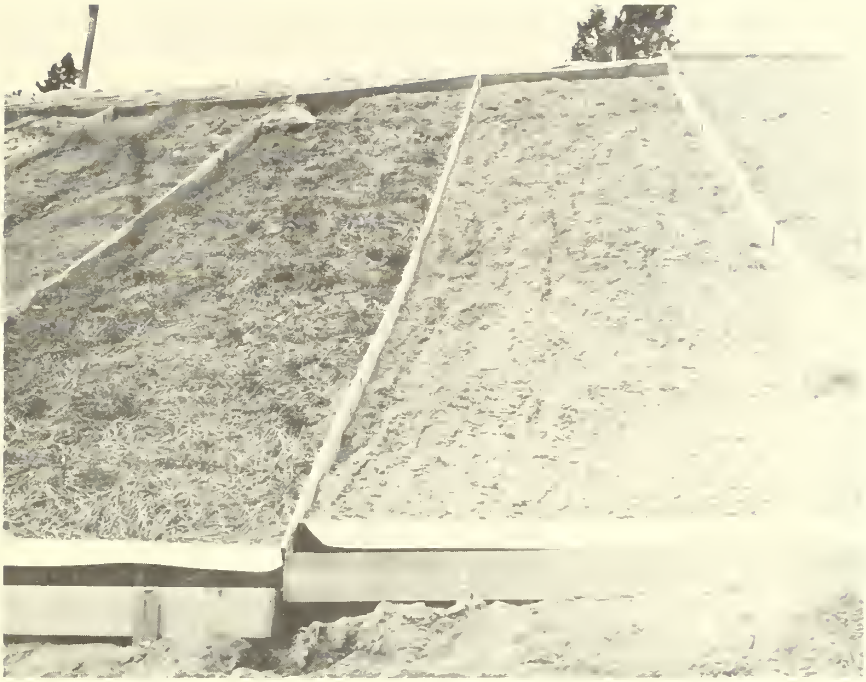

Figure 2.--Closeup view of test plots showing side baffles and the sediment-collecting trough at the bottom of plot.

The contour furrows plowed on plots 2 and 3 were spaced 6 feet apart and the holes on these two plots were punched 2 inches deep at 6-inch intervals. The straw mulch used on all but plots 2 and 4 was applied at a rate of 2 tons per acre. The polymer emulsion used on plot 4 consisted of 1 gallon "soil set" to 9 gallons of water; one half was sprayed before the seeding and fertilizing and one half after. The asphalt emulsion used on plot 8 was applied at the rate of 300 gallons per acre. All three types of netting--plots 5, 6, and 7--were fastened to the ground with staples made of 12-inch pieces of No. 9 wire.

The amount of soil eroded from each of the plots was weighed six times during the following 11 months. The first weighing was done on December 10, 1962--17 days after the plots were installed--and the last on October 11, 1963. Table 1 gives the cumulative results of these weighings.

Table 1.--Comparison of cumulative erosion from treated plots on a steep road fill
(in 1,000 lbs. per acre)

Cumulative elapsed time (days)	Cumulative precipitation	Control plot	Group A (seed, fertilizer)		Group B (seed, fertilizer, mulch)		Group C (seed, fertilizer, mulch, netting)		
			Plot number						
			2	4	3	8	5	6	7
	Inches								
17	1.41	31.9	38.7	38.0	0.1	32.6	0	0	0
80	4.71	70.0	99.2	85.7	7.4	34.6	0.9	0	0.3
157	12.46	72.2	100.2	86.9	11.1	35.1	1.1	0	0.4
200	15.25	79.1	101.0	87.6	11.4	35.7	1.1	0	0.4
255	17.02	82.3	102.8	88.8	11.5	35.8	1.1	0	0.4
322	20.40	84.2	104.7	89.4	11.9	36.0	1.1	0	0.4

DISCUSSION AND CONCLUSIONS

The seven treated plots were classified into the following groups based upon the elements used in the treatments:

Group	Plot number	Common elements
A	2,4	Seed and fertilizer
B	3,8	Seed and fertilizer plus straw mulch
C	5,6,7	Seed and fertilizer plus straw mulch plus netting

The average amounts of eroded material (in 1,000 lbs./acre) from each of these groups and their associated standard errors were: Group A, 97.1±7.3; Group B, 24.0±12.0; and Group C, 0.5±0.3.

Most of the erosion on the fill slope occurred during the first 3 months; thereafter, the rate of erosion declined markedly. As grass became established, the rates of erosion declined. Obviously, Group C plots had less erosion than plots in the other groups. The netting bound the mulch snugly to the soil, thus minimizing erosion by overland flow. Mulching prevented soil splash as a result of raindrop impact. Thus, erosion was checked during the time when the raw slope was most vulnerable as well as after the grass became established.